



Appearance Shock Grammar for Fast Medial Axis Extraction from Real Images



Charles-Olivier
Dufresne Camaro



Morteza Rezanejad



Stavros Tsogkas



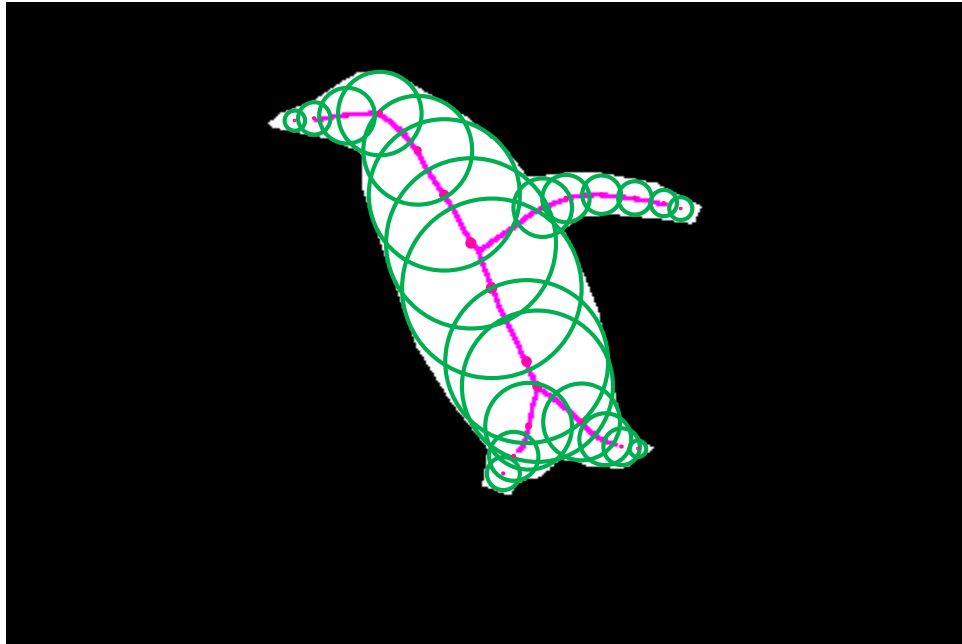
Kaleem Siddiqi



Sven Dickinson

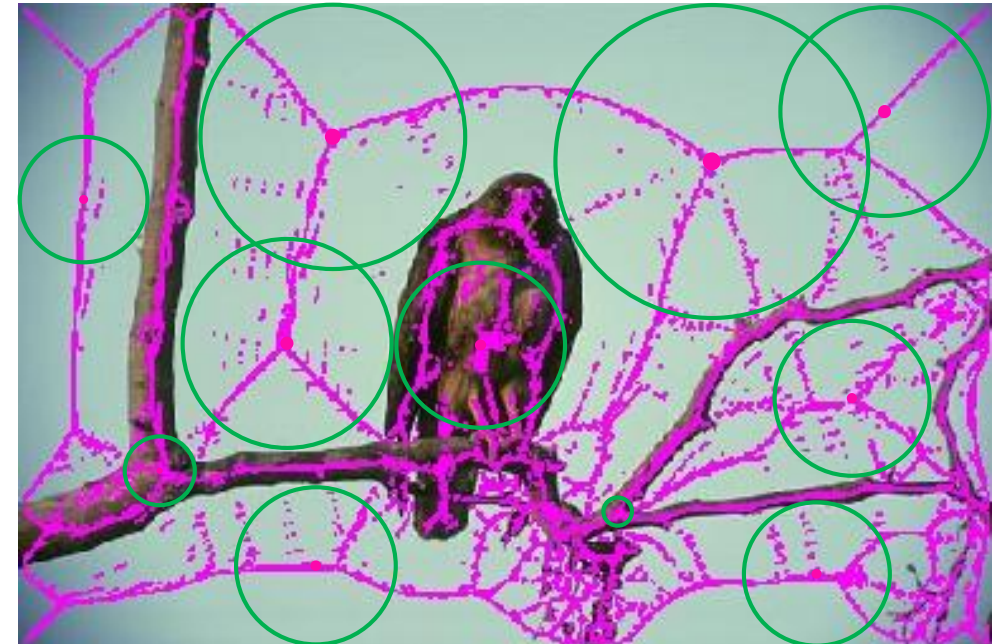
Medial Axis Transform (MAT)

MAT: Binary shapes



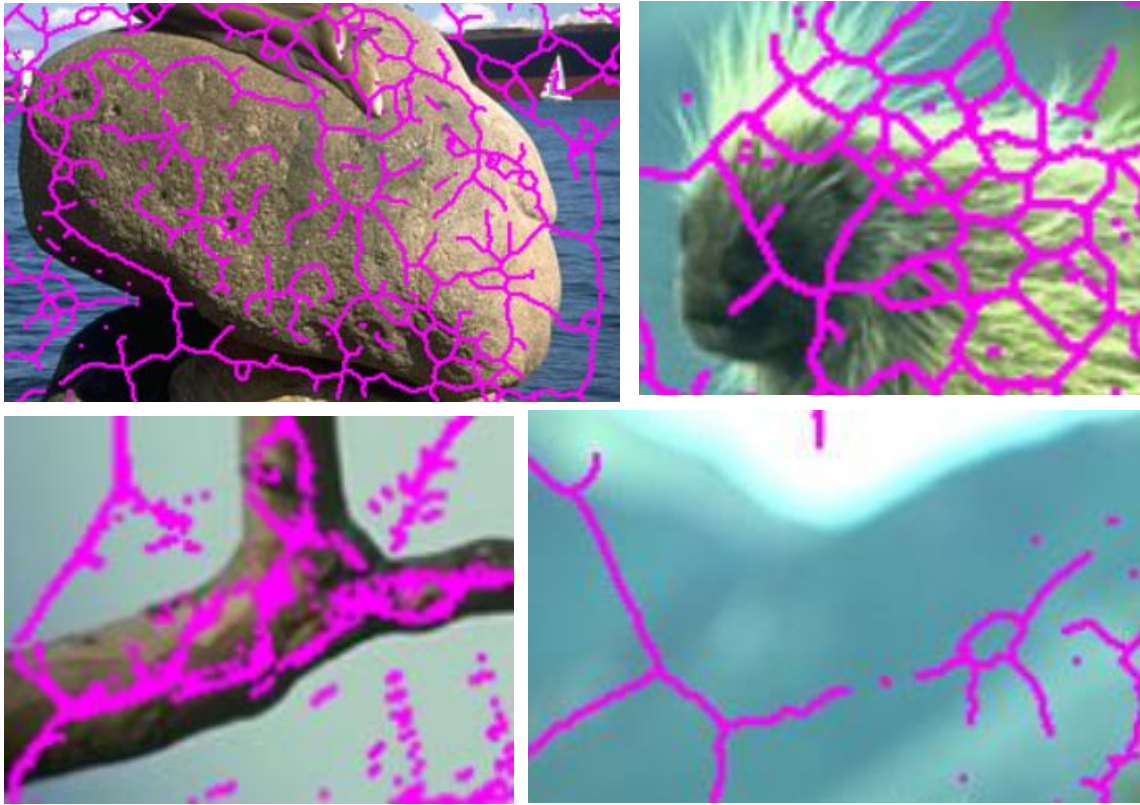
Blum, 1967

AMAT: Natural scenes



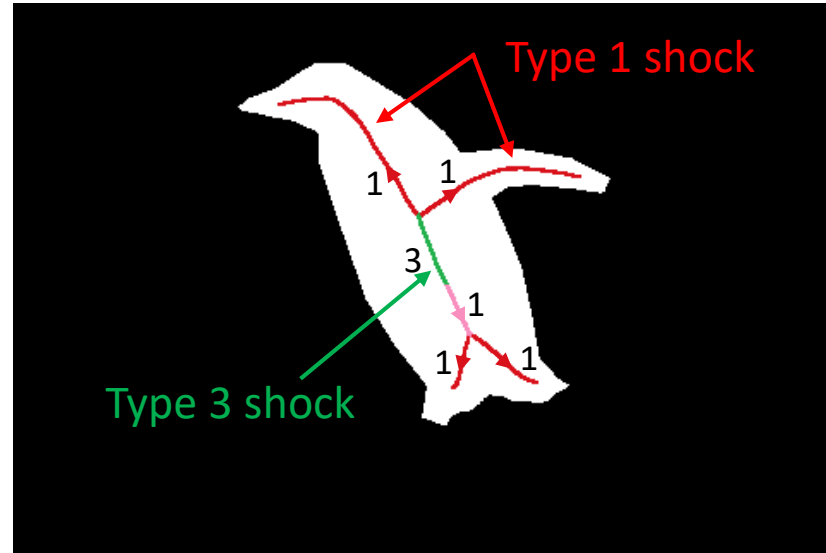
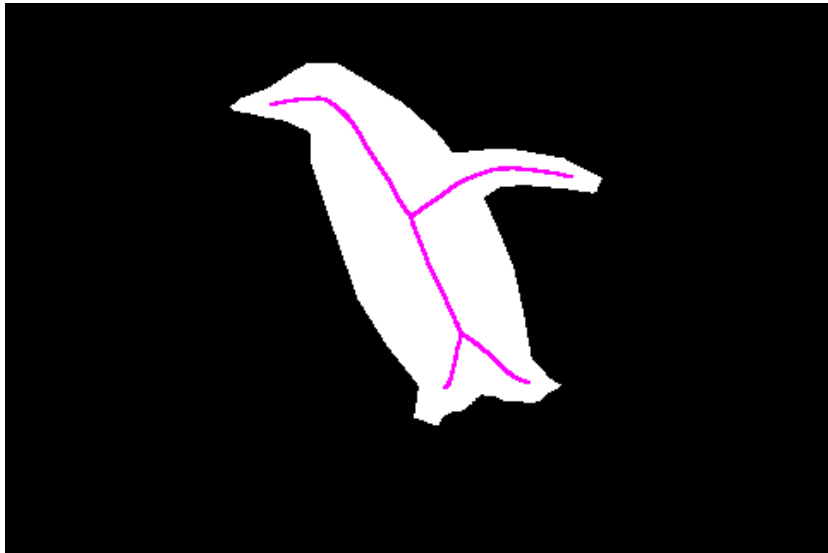
Tsogkas & Dickinson, 2017

AMAT limitations

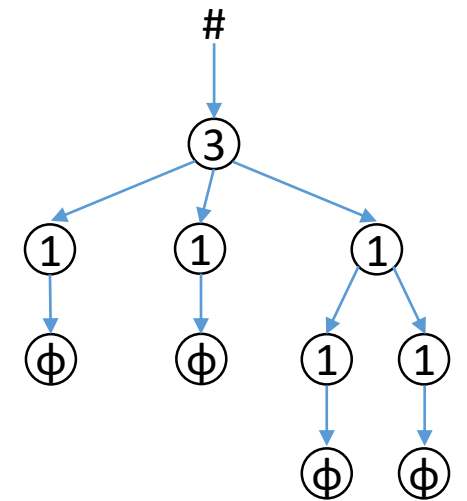


- Invalid topologies;
- “Thick” structures;
- Disconnected branches;
- Slow (~6.5min for 400x400 image).

Shock graph theory

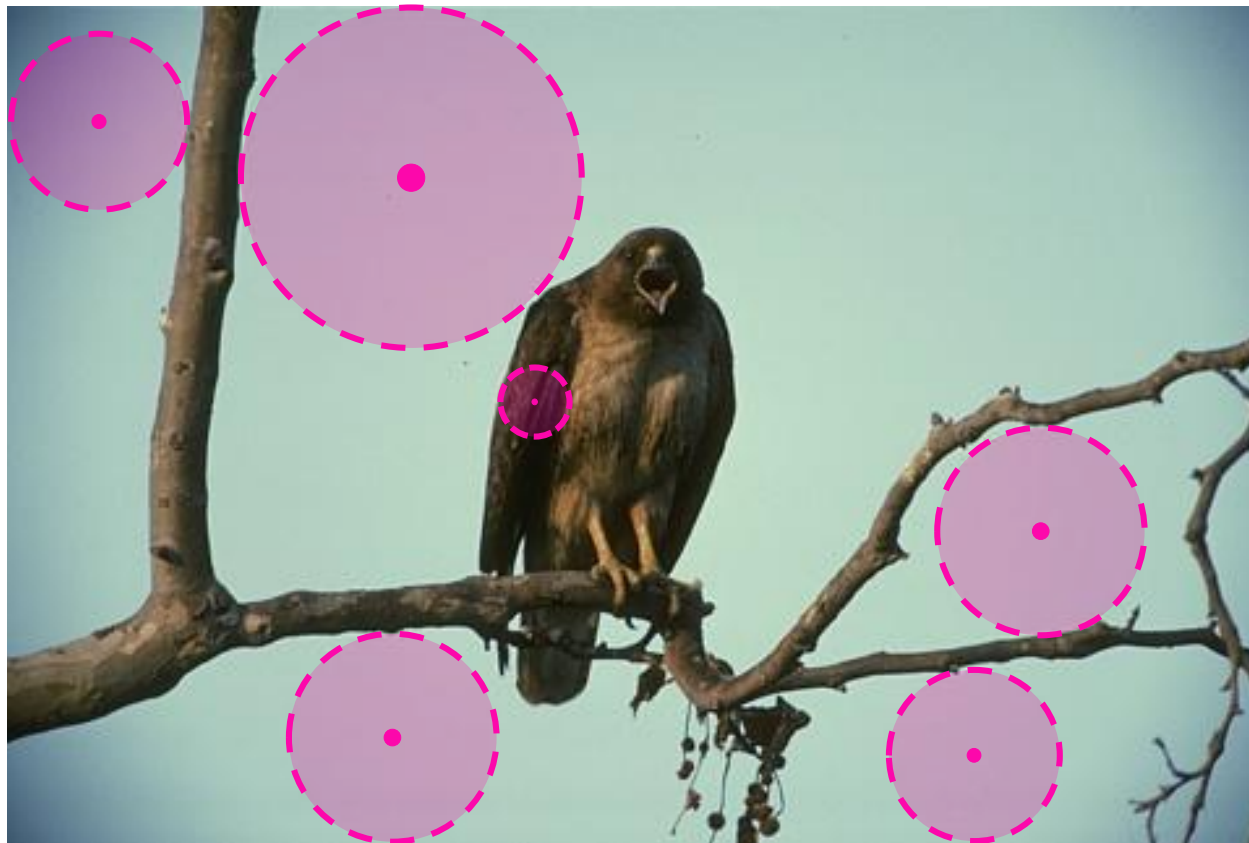


Shock graph

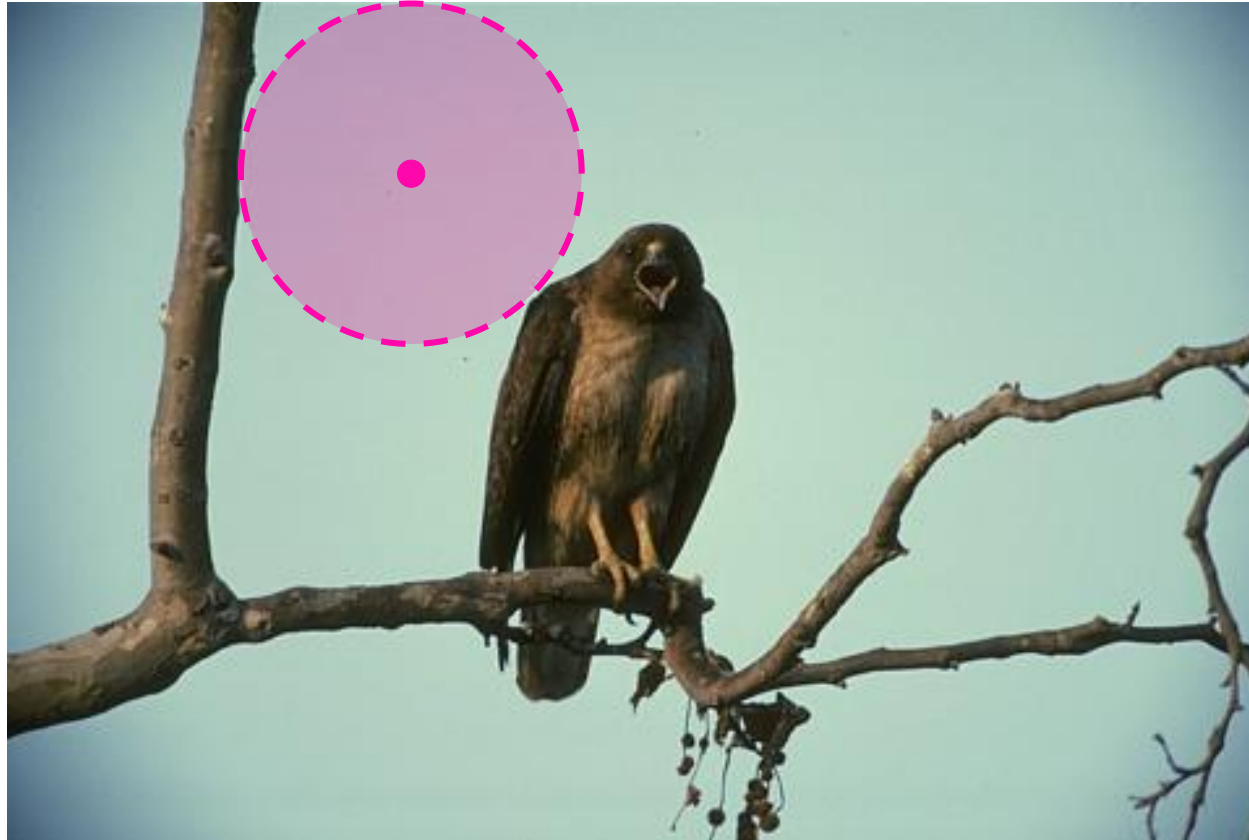


Application of shock grammar

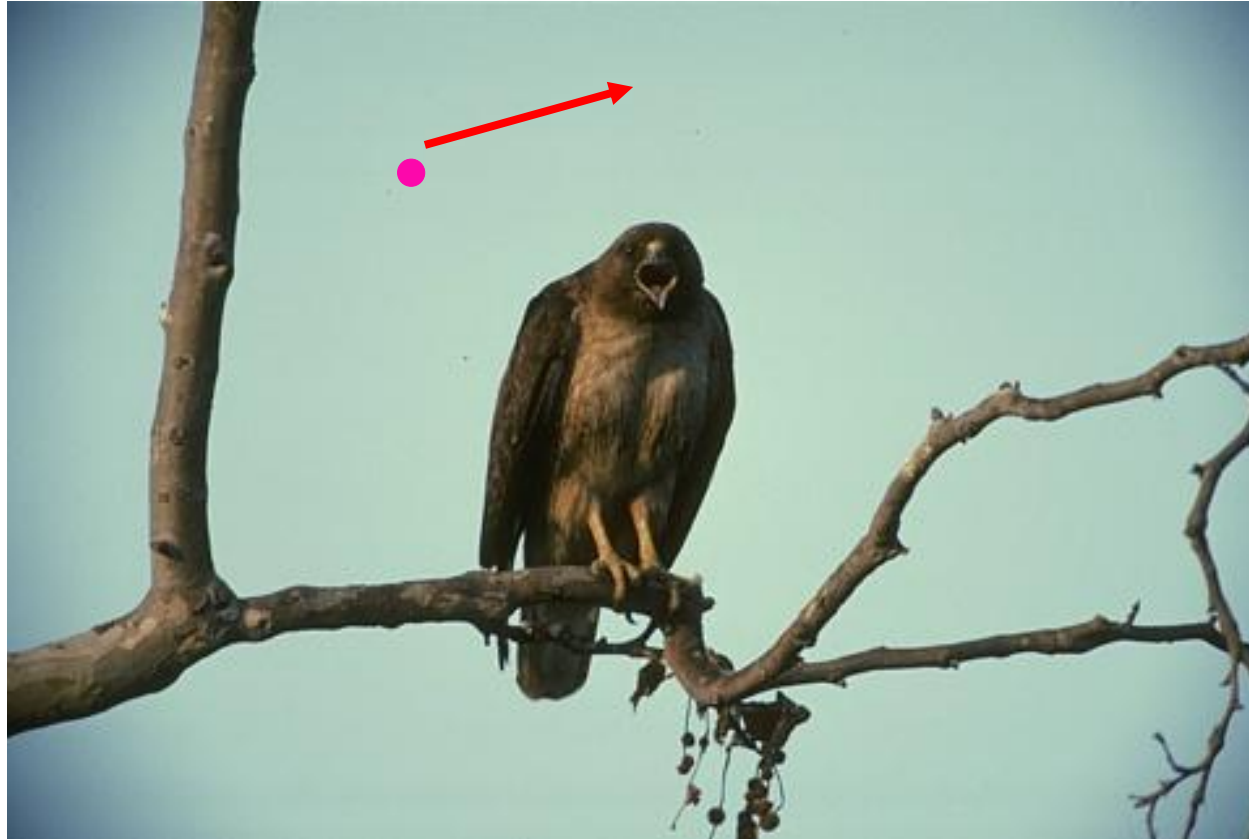
Medial axis extraction begins with a seed...



Medial axis extraction begins with a seed...



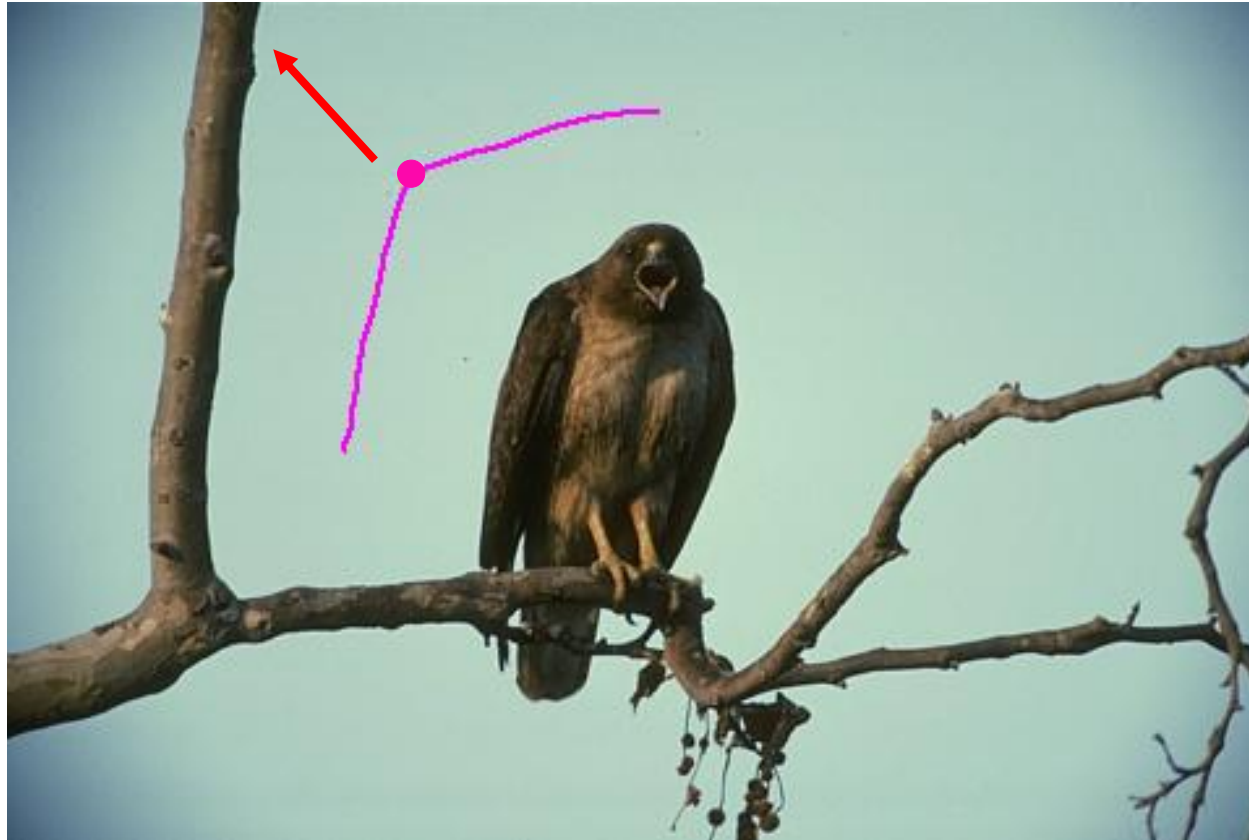
...which is then grown into medial branches.



...which is then grown into medial branches.



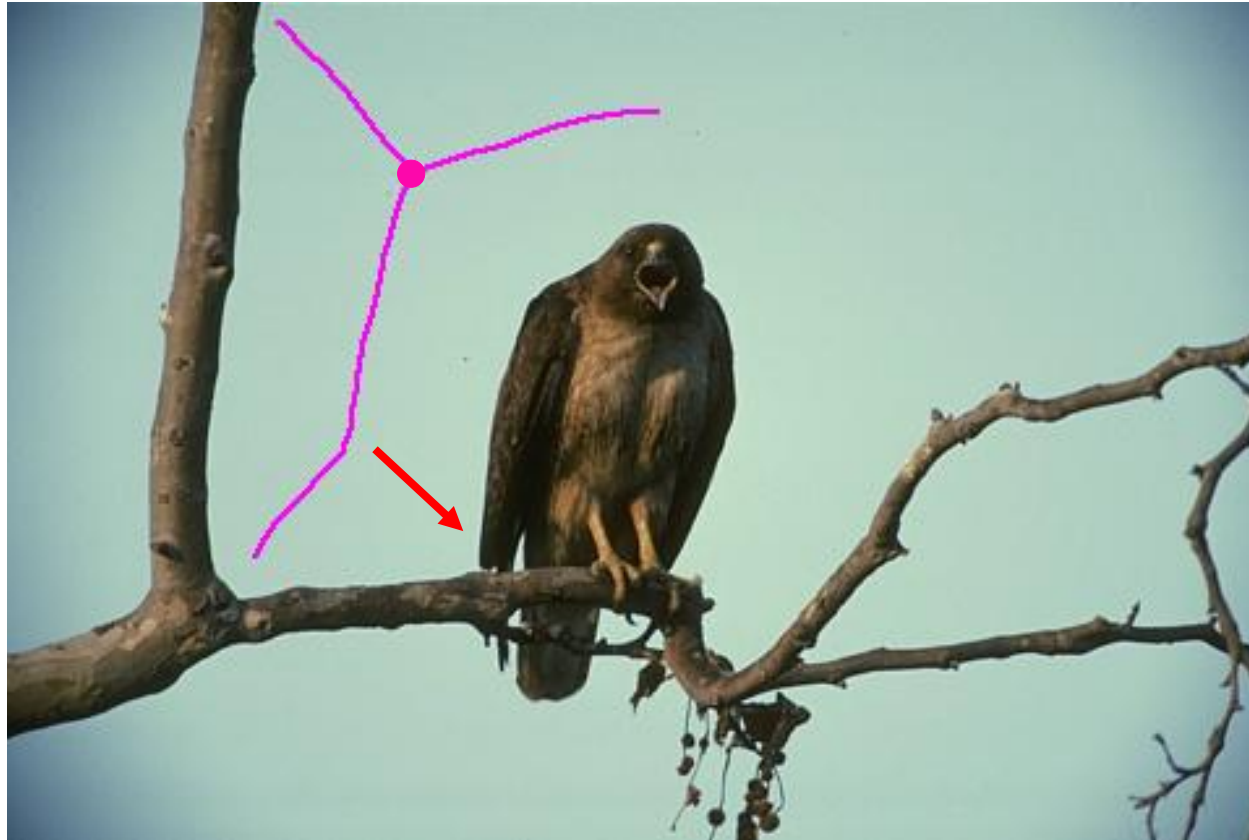
...which is then grown into medial branches.



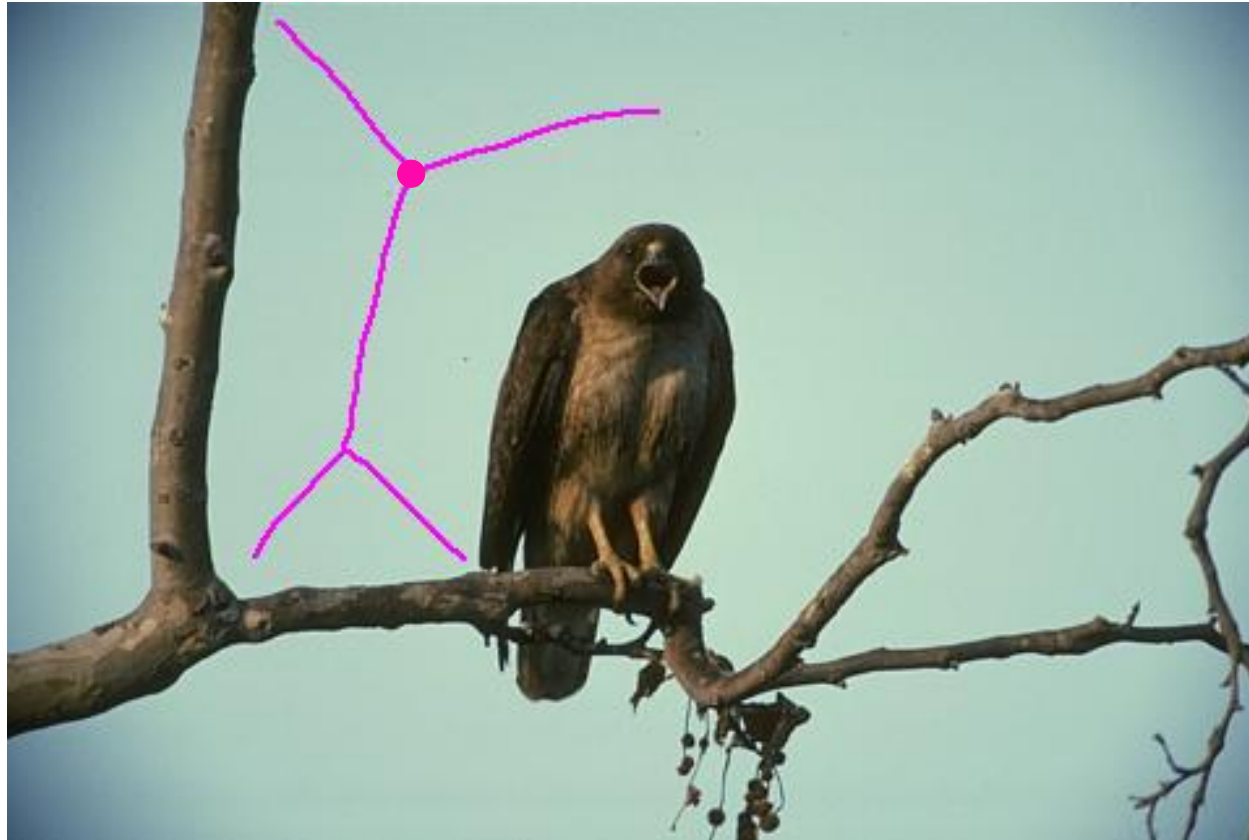
...which is then grown into medial branches.



...which is then grown into medial branches.



...which is then grown into medial branches.



Results



Ground truth



AMAT (State-of-the-art)

F1 = 0.434

t = 393 s



ASG (this work)

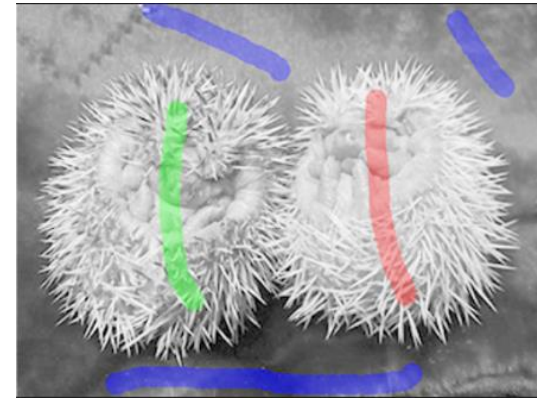
F1 = 0.522 ~9% gains!

t = 35 s 10x speed up!

Applications



Scene retrieval



Interactive segmentation



Constrained image editing



Painterly rendering

Code available at: github.com/CharloCamaro/ASG

